6-4 Completing the Square

ex 1
$(x-5)^2 = 4$

$(x-5)(x-5) = 4$
$x^2 - 10x + 25 = 4$
$x^2 - 10x + 21 = 0$
$(x-7)(x-3) = 0$
$x = 7 \quad x = 3$

OR $\sqrt{(x-5)^2} = \sqrt{4}$
$x - 5 = \pm 2$
$x = 5 \pm 2$
$\{7, 3\}$

ex 2
$\sqrt{(x-3)^2} = \sqrt{7}$
$x - 3 = \pm\sqrt{7}$
$x = 3 \pm \sqrt{7}$
$\{3 \pm \sqrt{7}\}$

ex 3
$(2x-3)^2 = 5$

ex 4
$x^2 - 6x - 3 = 0$
$x^2 - 6x + 9 = 3 + 9$
$\sqrt{(x-3)^2} = \sqrt{12}$
$x - 3 = \pm 2\sqrt{3}$
$x = 3 \pm 2\sqrt{3}$

Steps
1. Transform equation so constant (c) is alone on right side.
2. If $a \neq 1$, then divide both sides by a.
3. Add the square of one-half b to both sides.
4. Factor left side.
5. Solve.

ex 5
$x^2 - 5x + 3 = 0$

$-\frac{12}{4} + \frac{25}{4}$
$x^2 - 5x + \frac{25}{4} = -3 + \frac{25}{4}$
$\sqrt{(x - \frac{5}{2})^2} = \sqrt{\frac{13}{4}}$ $\frac{\sqrt{13}}{\sqrt{4}}$
$x - \frac{5}{2} = \pm\frac{\sqrt{13}}{2}$
$x = \frac{5 \pm \sqrt{13}}{2}$

ex 6
$2x^2 + 2x + 5 = 0$

$2x^2 + 2x = -5$

$\div 2$

$x^2 + x + \frac{1}{4} = -\frac{5}{2} + \frac{1}{4}$

$\left(x + \frac{1}{2}\right)^2 = -\frac{9}{4}$

$x + \frac{1}{2} = \pm\frac{3i}{2}$

$x = -\frac{1 \pm 3i}{2}$

Do
1. $3x^2 + 12x + 1 = 0$

$x^2 + 4x + 4 = -\frac{1}{3} + 4$

$(x+2)^2 = \frac{11}{3}$

$x + 2 = \pm\sqrt{\frac{11}{3}}$

$-2 \pm \frac{\sqrt{33}}{3}$

2. $x^2 - x - 1 = 0$

$x^2 - x + \frac{1}{4} = 1 + \frac{1}{4}$

$\left(x - \frac{1}{2}\right)^2 = \frac{5}{4}$

$x - \frac{1}{2} = \frac{\pm\sqrt{5}}{2}$

$\frac{1 \pm \sqrt{5}}{2}$

HW
p311
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